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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/916,211	07/25/2001	Russell Howard Barton	130109.407	6847

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EXAMINER	
CREPEAU, JONATHAN	
ART UNIT	**PAPER NUMBER**
1746	6

DATE MAILED: 03/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/916,211	BARTON ET AL.	
	Examiner	Art Unit	
	Jonathan S. Crepeau	1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 July 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-43* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-43* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12-18-01, 8-5-03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 8 is objected to because of the following informalities: at the end of line 1, the word "is" should be inserted. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 11, 13, 16, 17, 21, and 38 are rejected under 35 U.S.C. 102(e) as being anticipated by Herron (U.S. Patent 6,242,120). Regarding claims 11, 16, 21, and 38, the reference is directed to a system and method for purging a fuel cell stack (see abstract). The fuel cell stack comprises purge valves (32), actuators for opening and closing the valves, and a controller (40) for controlling the actuators (see Fig. 1; col. 4, line 33). The controller actuates the purge assembly upon the measurement of a process parameter reaching a purging condition value (see col. 4 line 39 et seq.). The fuel cell is purged in pulsed manner until the value of the measured parameter is reduced below a threshold value (see Fig. 2). This disclosure is considered to be

anticipatory of the claimed "hold period" between pulsed purges. The purge valve is subsequently kept closed for an inter-purge duration while the process parameter remains below the purge condition value. Regarding claims 13 and 17, the inter-purge duration would be longer than the hold periods and the purge durations during normal operation of the assembly. Regarding claim 38, the controller includes software executing on a processor (see col. 5, line 31).

Thus, the instant claims are anticipated.

4. Claims 11, 13, 14, 16-21 and 33 are rejected under 35 U.S.C. 102(e) as being anticipated by Sawyer (U.S. Patent 6,569,549). Regarding claims 11, 14, 16, 21, and 33, the reference is directed to a system and method for purging a fuel cell stack (see abstract). The fuel cell stack comprises a purge valve (30), an actuator for opening and closing the valve, and a controller (32) for controlling the actuators (see Fig. 3). The controller actuates the purge assembly upon the measurement of a process parameter (e.g., nitrogen concentration) reaching a purging condition value (see col. 8 line 50 et seq.). The fuel cell is purged in pulsed manner until the value of the measured parameter is reduced below a threshold value (see Fig. 7). This disclosure is considered to be anticipatory of the claimed "hold period" between pulsed purges. The purge valve is subsequently kept closed for an inter-purge duration while the process parameter remains below the purge condition value. Regarding claims 13 and 17, the inter-purge duration (20 seconds) is longer than the purge duration (0.5-2.5 seconds) (see col. 7, line 56; col. 8, line

2). The inter-purge duration would also be longer than the hold periods during normal operation of the assembly. Regarding claims 14, 18-20, and 33, the duration of the purge pulse is determined based on the current density of the fuel cell stack (see col. 7, line 51 et seq.); therefore, the durations of the pulses may be the same or different.

Thus, the instant claims are anticipated.

5. Claims 1-3, 25, 26, and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Strasser et al (U.S. Patent 3,935,028). Regarding claims 1 and 25, the reference is directed to a fuel cell stack (see abstract). The fuel cell stack comprises purge valves (63, 64), an actuator for opening and closing the valves, and a controller (32) for controlling the actuators (see Fig. 2; col. 5, line 10 et seq., col. 7, line 31). Regarding claims 1-3, 25, 26, and 28, the fuel cells in the stack are cascaded, and the voltage of the last cell (i.e., the "purge" cell) is measured and compared to an average voltage of the cell stack (see col. 5, line 10 et seq). When the voltage of the purge cell reaches a threshold voltage (i.e., a defined percentage of a threshold voltage of the entire stack), purging of the fuel cell is actuated and the purge is sustained for a determined period of time.

Thus, the instant claims are anticipated.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 35, 36, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawyer.

The reference is applied to claims 11, 13, 16-21 and 33 for the reasons stated above. Further, regarding claim 35, the reference teaches that the purge valve is opened during startup of the fuel cell (see col. 8, line 23).

However, the reference does not expressly teach that the purge valve is also opened during a shutdown of the fuel cell stack, as recited in claim 35, or that the controller contains a computer-readable media containing instructions for causing a processor to control the fuel cell system, as recited in claim 41.

However, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to open the purge valve of Sawyer during shutdown of the fuel cell stack. Such a purging step would leave the system in a state more conducive to starting up; i.e., the system would be more "ready" to be started up. Furthermore, the purge valve may be operated on a "timed schedule" (col. 6, line 18), which timed purges would be dispersed throughout the operation of the system, i.e., during

startup, steady state operation, and shutdown. Accordingly, the subject matter of claim 35 would be rendered obvious to the skilled artisan.

Regarding the computer-readable media containing instructions for causing a processor to control the fuel cell system, as recited in claim 41, this subject matter would also be obvious to the skilled artisan. In column 2, line 17, Sawyer teaches that conventional PEM fuel cell assemblies contain "a microprocessor that controls the operation of the fuel cell power plant." Such microprocessors are routinely controlled by instructions which reside in a computer-readable memory area of the controller, e.g., a read-only memory (ROM). Accordingly, the artisan would be motivated to use such a configuration in the system of Sawyer to efficiently and precisely control the operation of the system.

8. Claims 4, 6-10, 27, 31, 32, 39, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Strasser et al.

The reference is applied to claims 1-3, 25, 26, and 28 for the reasons stated above. However, the reference does not expressly teach that that purge cell portion comprises at least two cells (claim 9), that an "average" purge cell voltage is measured (claim 4), or that the defined first percentage of the average fuel cell voltage is approximately 90% (claims 10 and 27), or that the purge valve is closed when the average purge cell voltage rises above a second defined percentage of the average fuel cell voltage (claims 6, 31, and 40). The reference further

does not teach that the controller contains a computer-readable media containing instructions for causing a processor to control the fuel cell system, as recited in claim 39.

However, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would first be motivated to use a plurality of fuel cell as the purge cell portion of Strasser, as recited in claim 9. In column 5, line 11, the reference teaches "the last stage of the cascade, which for instance, consists of one cell." Thus, the reference does not limit the purge cell portion to just one cell. Furthermore, the duplication of parts generally is not considered to patentably distinguish over a reference (MPEP 2144.04(VI)). Regarding claim 4, upon using a plurality of fuel cells in the purge cell portion, the artisan would be motivated to use an average voltage measurement of the cells in the purging control scheme.

Furthermore, although the reference does not expressly teach that the purge valve is closed when the average purge cell voltage rises above a second defined percentage of the average fuel cell voltage (claims 6, 31, and 40), this configuration would be obvious to one of ordinary skill in the art. The artisan would be motivated to close the purge valve as quickly as possible in hopes of not purging viable reactant material out of the system. Thus, a control scheme utilizing a threshold voltage to automatically stop the purging would be obvious to the skilled artisan.

Regarding the limitation the defined first percentage of the average fuel cell voltage is approximately 90% to initiate purging (claims 10 and 27), this limitation would also be rendered obvious to the skilled artisan. The artisan would be able to manipulate the threshold voltage for initiating purging o as to result in a system that is efficient as possible. It has been held that the

discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art. *In re Boesch*, 205 USPQ 215 (CCPA 1980). Thus, the claimed value of 90% is considered to be obvious to the skilled artisan. Regarding claims 7, 8, and 32, which recite that the first threshold voltage for purge initiation and second threshold voltage for purge cessation are different, this subject matter would also be within the skill of the art based on the disclosure of the reference. As noted above, upon purging, the artisan would be motivated to close the purge valve as quickly as possible in hopes of not purging viable reactant material out of the system. The determination of such a voltage point for stopping the purge operation would also be a matter of routine optimization of the system. Accordingly, the voltage relationships defined in claims 7, 8, and 32 are also not considered to distinguish over the reference.

Regarding the computer-readable media containing instructions for causing a processor to control the fuel cell system as recited in claim 39, this subject matter would also be obvious to the skilled artisan. As noted above, control systems are routinely controlled by instructions which reside in a computer-readable memory area of the controller, e.g., a read-only memory (ROM). Accordingly, the artisan would be motivated to use such a configuration in the system of Strasser to efficiently and precisely control the operation of the system.

9. Claims 1, 5, 12, 15, 22-25, 29, 30, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawyer in view of Strasser.

Sawyer is applied to claims 11, 13, 14, 16-21 and 33 for the reasons stated above. However, the reference does not expressly teach that a voltage is measured across a purge cell portion of the stack and compared to the entire stack voltage, and that the stack is purged accordingly, as recited in claims 1, 12, 15, 22-25 and 34.

As set forth above, Strasser teaches a fuel cell system wherein the purging of the fuel cell is based on the voltage of a purge cell portion as compared with the average voltage of the fuel cell.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to incorporate the voltage measurements of Strasser into the control scheme of Sawyer. As discussed in Sawyer, nitrogen accumulates throughout the anode flow field of the fuel cell and is measured at a point near the outlet of the system. Similarly, in column 5, line 10, Strasser teaches that "[i]n this process, inert-gas components accumulate in the last stage of the cascade, which for instance, consists of one cell, whereby the voltage of the last stage of the cascade drops." Thus, it is seen that a voltage measurement of the purge cell of Sawyer would be analogous to a nitrogen concentration measurement, as the nitrogen concentration adversely affects the voltage. Accordingly, the artisan would be motivated to use the voltage measurements of Strasser in the system of Sawyer, as these measurements are easy to make with voltage sensors and produce a result which is a direct measure of the performance of the system.

10. Claims 37, 42, and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sawyer as applied to claims 35, 36, and 41 above, and further in view of Strasser.

Sawyer does not does not expressly teach that a voltage is measured across a purge cell portion of the stack and the stack is purged accordingly, as recited in claims 37 and 42.

As set forth above, Strasser teaches a fuel cell system wherein the purging of the fuel cell is based on the voltage of a purge cell portion as compared with the average voltage of the fuel cell.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated to incorporate the voltage measurements of Strasser into the control scheme of Sawyer. As discussed in Sawyer, nitrogen accumulates throughout the anode flow field of the fuel cell and is measured at a point near the outlet of the system. Similarly, in column 5, line 10, Strasser teaches that "[i]n this process, inert-gas components accumulate in the last stage of the cascade, which for instance, consists of one cell, whereby the voltage of the last stage of the cascade drops." Thus, it is seen that a voltage measurement of the purge cell of Sawyer would be analogous to a nitrogen concentration measurement, as the nitrogen concentration adversely affects the voltage. Accordingly, the artisan would be motivated to use the voltage measurements of Strasser in the system of Sawyer, as these measurements are easy to make with voltage sensors and produce a result which is a direct measure of the performance of the system.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (571) 272-1299. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski, can be reached at (571) 272-1302. The phone number for the organization where this application or proceeding is assigned is (571) 272-1700. Documents may be faxed to the central fax server at (703) 872-9306.

Jonathan Crepeau
Patent Examiner
Art Unit 1746
March 22, 2004